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(54) **CALL TRANSFER SYSTEM AND METHOD**

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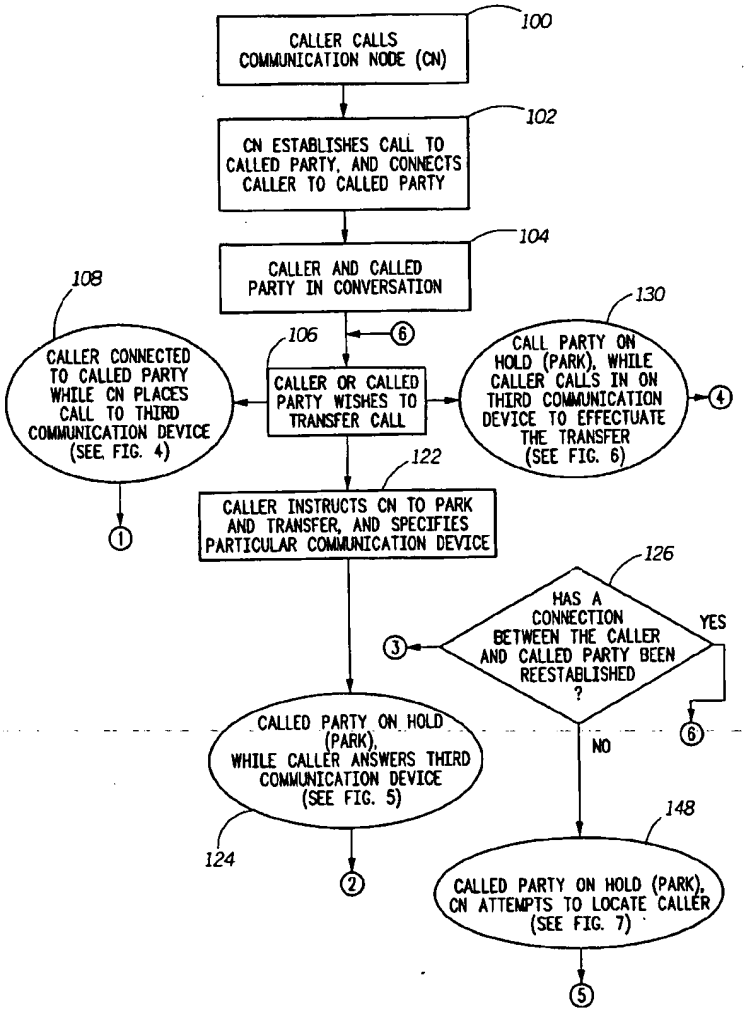
(57) **ABSTRACT**

A system and method of transferring a call is provided. One method of transferring a call across networks of a transport system in accordance with the present invention includes the steps of connecting the first communication device to the communication node over a first network of the transport system and connecting the second communication device with the first communication device. The method includes establishing a connection between the third communication device and the communication node over a second network of the transport system and connecting the second communication device to the third communication device.



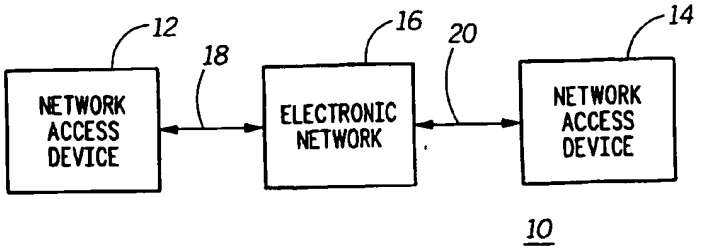

12
16
20
14
18
NETWORK ACCESS DEVICE
ELECTRONIC NETWORK
NETWORK ACCESS DEVICE
10

FIG. 1

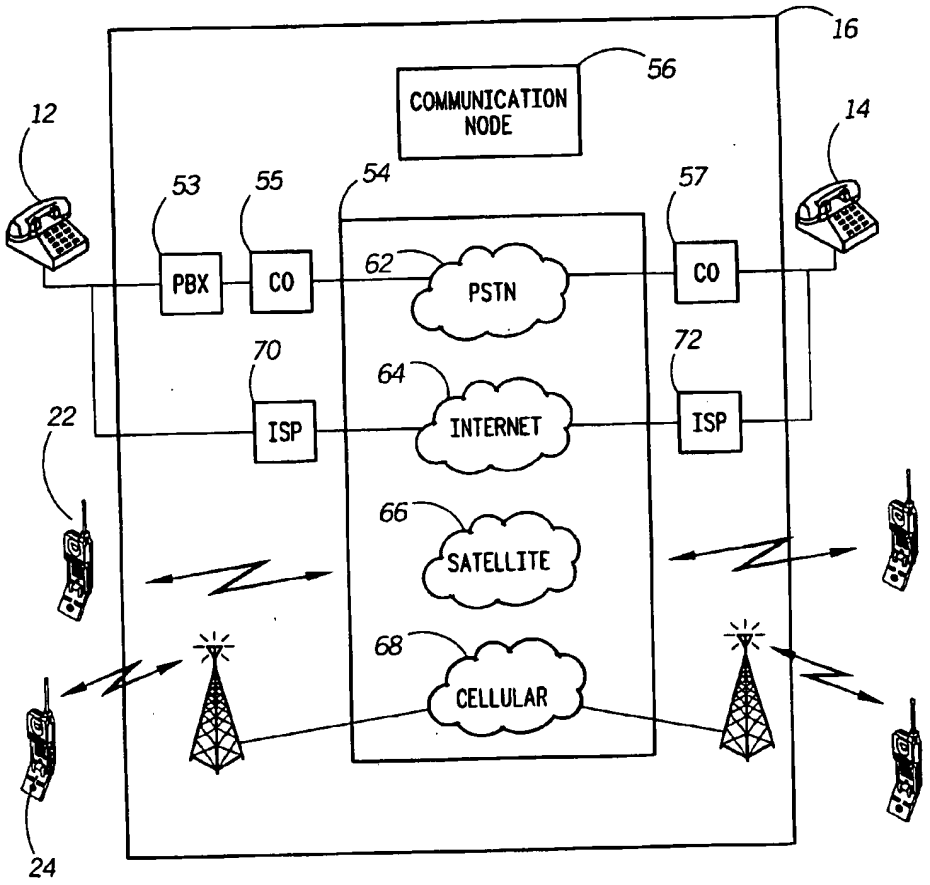

16
56
COMMUNICATION NODE
12
14
53
55
54
57
PBX
CO
62
PSTN
CO
70
64
72
22
ISP
INTERNET
ISP
66
SATELLITE
68
CELLULAR
24
10

FIG. 2

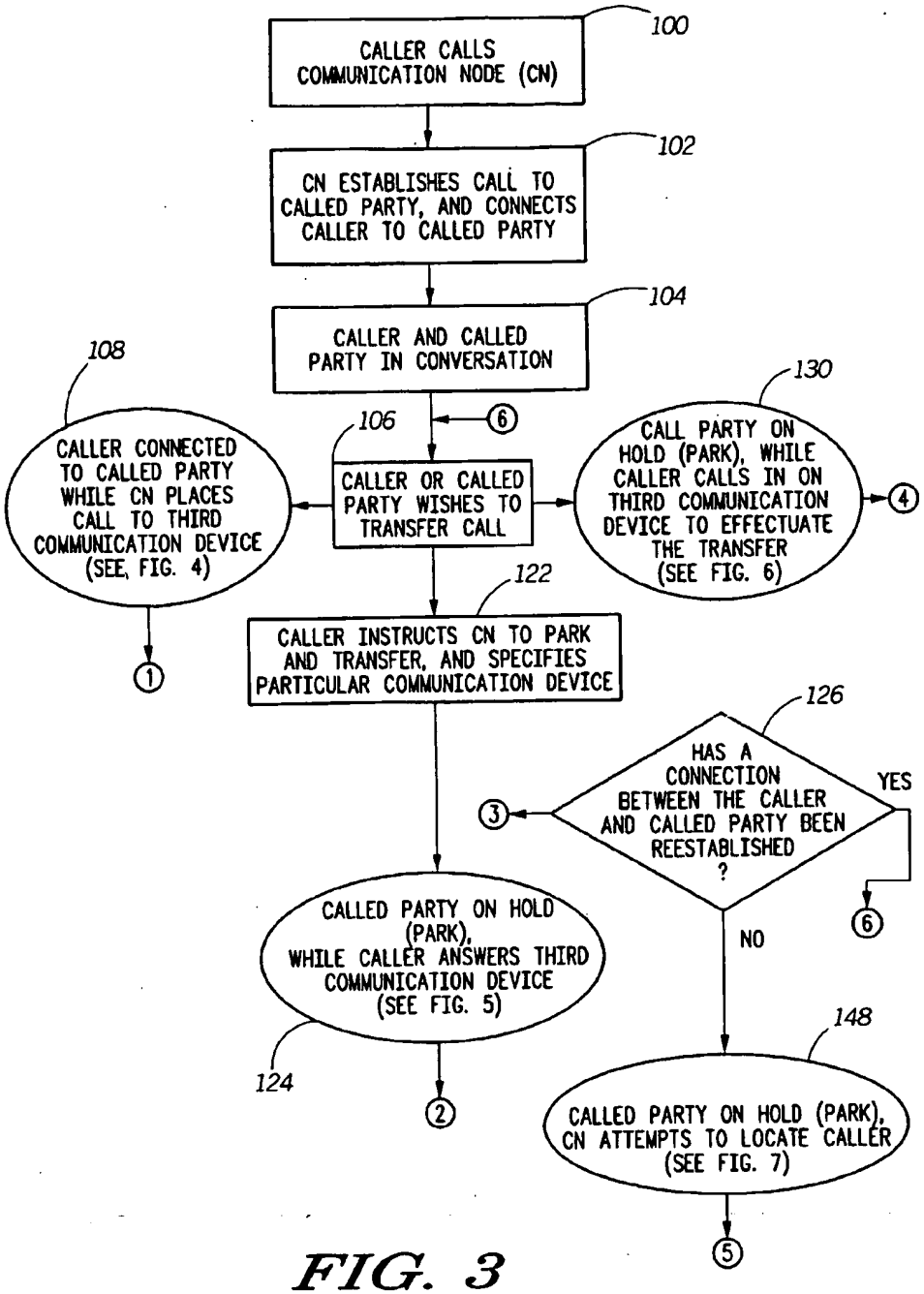

100
CALLER CALLS COMMUNICATION NODE (CN)
102
CN ESTABLISHES CALL TO CALLED PARTY, AND CONNECTS CALLER TO CALLED PARTY
104
CALLER AND CALLED PARTY IN CONVERSATION
108
CALLER CONNECTED TO CALLED PARTY WHILE CN PLACES CALL TO THIRD COMMUNICATION DEVICE (SEE, FIG. 4)
106
6
CALLER OR CALLED PARTY WISHES TO TRANSFER CALL
130
CALL PARTY ON HOLD (PARK), WHILE CALLER CALLS IN ON THIRD COMMUNICATION DEVICE TO EFFECTUATE THE TRANSFER (SEE FIG. 6)
4
1
122
CALLER INSTRUCTS CN TO PARK AND TRANSFER, AND SPECIFIES PARTICULAR COMMUNICATION DEVICE
126
HAS A CONNECTION BETWEEN THE CALLER AND CALLED PARTY BEEN REESTABLISHED ?
YES
3
6
NO
CALLED PARTY ON HOLD (PARK), WHILE CALLER ANSWERS THIRD COMMUNICATION DEVICE (SEE FIG. 5)
124
2
148
CALLED PARTY ON HOLD (PARK), CN ATTEMPTS TO LOCATE CALLER (SEE FIG. 7)
5

FIG. 3

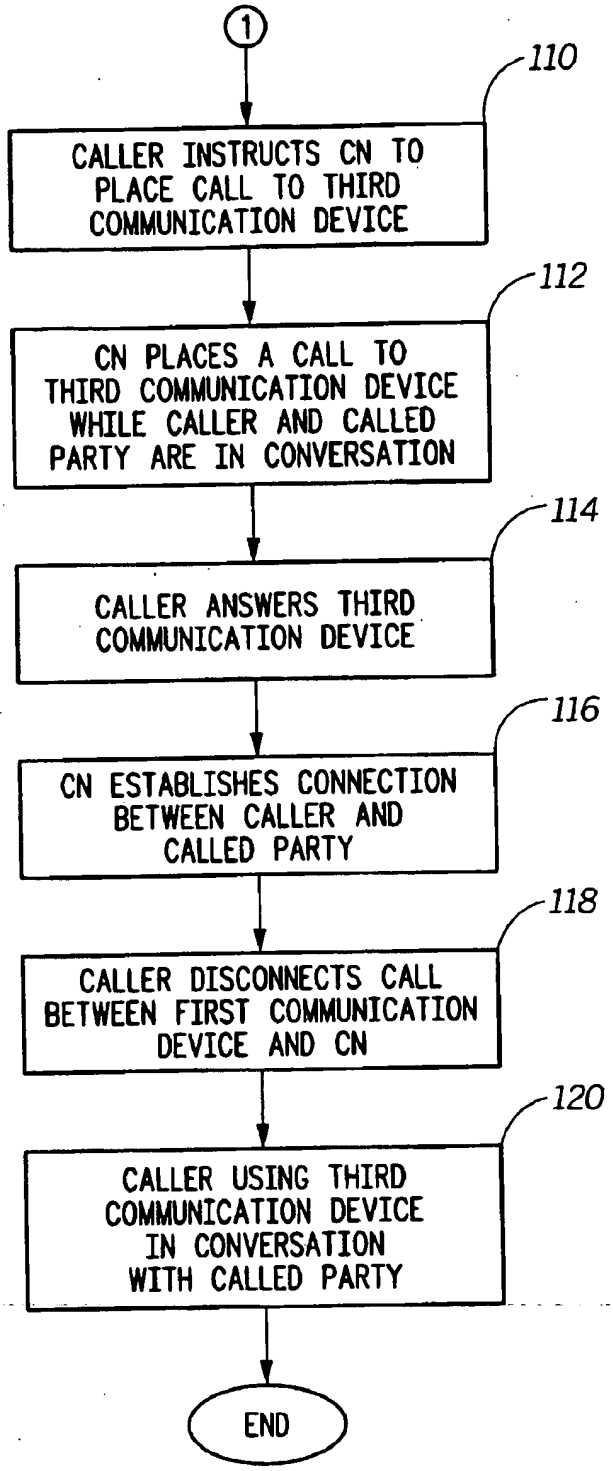

1
110
CALLER INSTRUCTS CN TO PLACE CALL TO THIRD COMMUNICATION DEVICE
112
CN PLACES A CALL TO THIRD COMMUNICATION DEVICE WHILE CALLER AND CALLED PARTY ARE IN CONVERSATION
114
CALLER ANSWERS THIRD COMMUNICATION DEVICE
116
CN ESTABLISHES CONNECTION BETWEEN CALLER AND CALLED PARTY
118
CALLER DISCONNECTS CALL BETWEEN FIRST COMMUNICATION DEVICE AND CN
120
CALLER USING THIRD COMMUNICATION DEVICE IN CONVERSATION WITH CALLED PARTY
END

FIG. 4

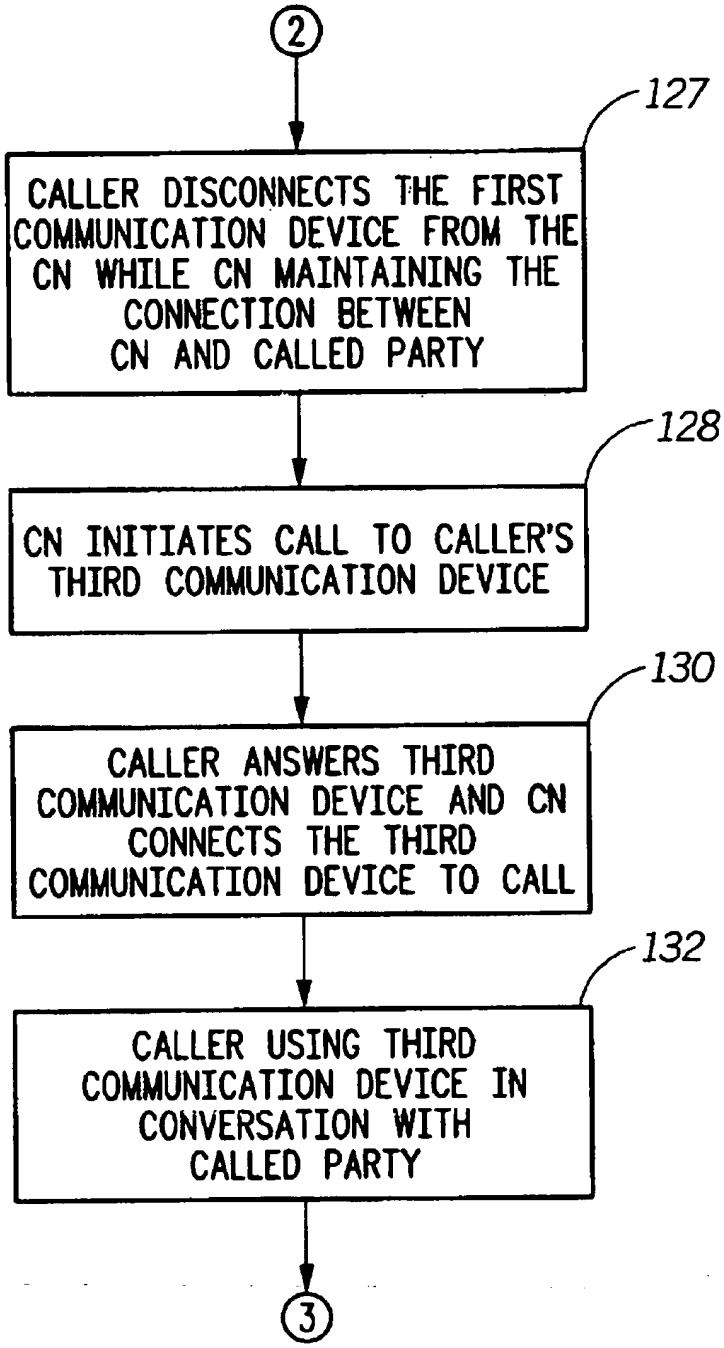

2
127
CALLER DISCONNECTS THE FIRST COMMUNICATION DEVICE FROM THE CN WHILE CN MAINTAINING THE CONNECTION BETWEEN CN AND CALLED PARTY
128
CN INITIATES CALL TO CALLER'S THIRD COMMUNICATION DEVICE
130
CALLER ANSWERS THIRD COMMUNICATION DEVICE AND CN CONNECTS THE THIRD COMMUNICATION DEVICE TO CALL
132
CALLER USING THIRD COMMUNICATION DEVICE IN CONVERSATION WITH CALLED PARTY
3

FIG. 5

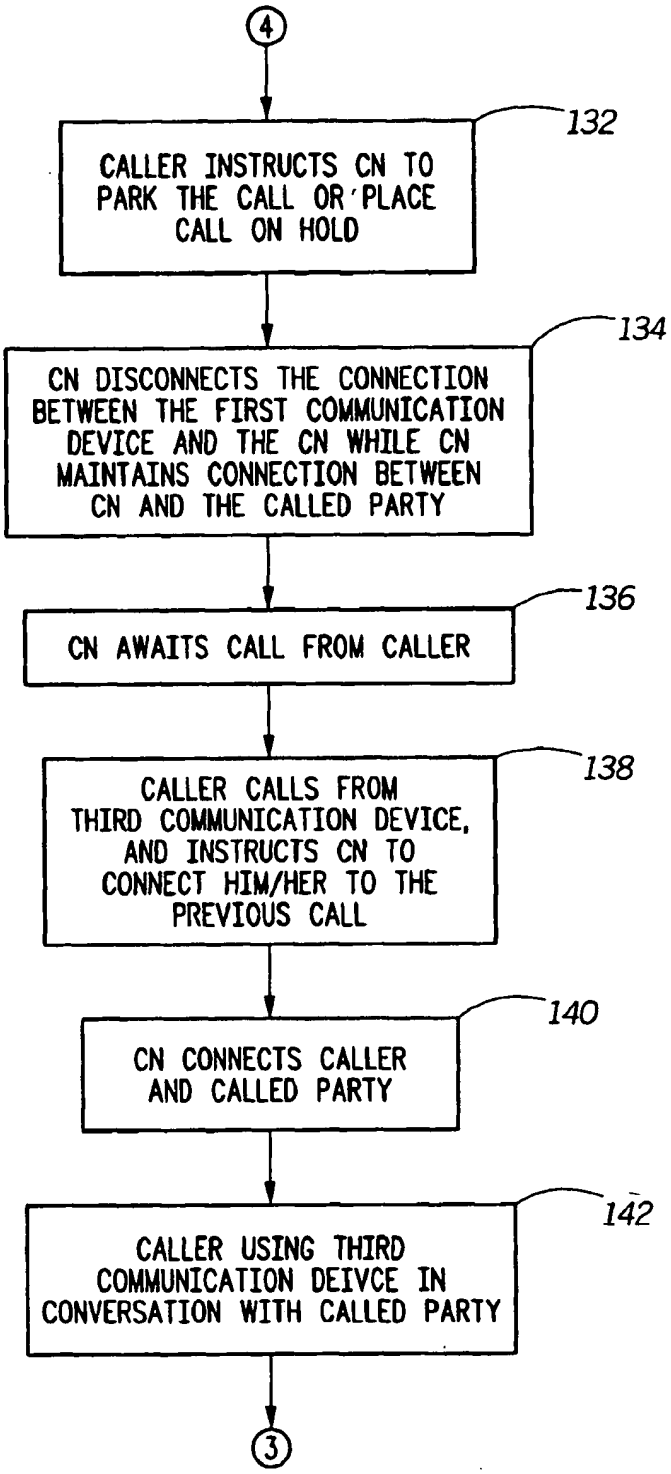

4
132
CALLER INSTRUCTS CN TO PARK THE CALL OR PLACE CALL ON HOLD
134
CN DISCONNECTS THE CONNECTION BETWEEN THE FIRST COMMUNICATION DEVICE AND THE CN WHILE CN MAINTAINS CONNECTION BETWEEN CN AND THE CALLED PARTY
136
CN AWAITS CALL FROM CALLER
138
CALLER CALLS FROM THIRD COMMUNICATION DEVICE, AND INSTRUCTS CN TO CONNECT HIM/HER TO THE PREVIOUS CALL
140
CN CONNECTS CALLER AND CALLED PARTY
142
CALLER USING THIRD COMMUNICATION DEIVCE IN CONVERSATION WITH CALLED PARTY
3

FIG. 6

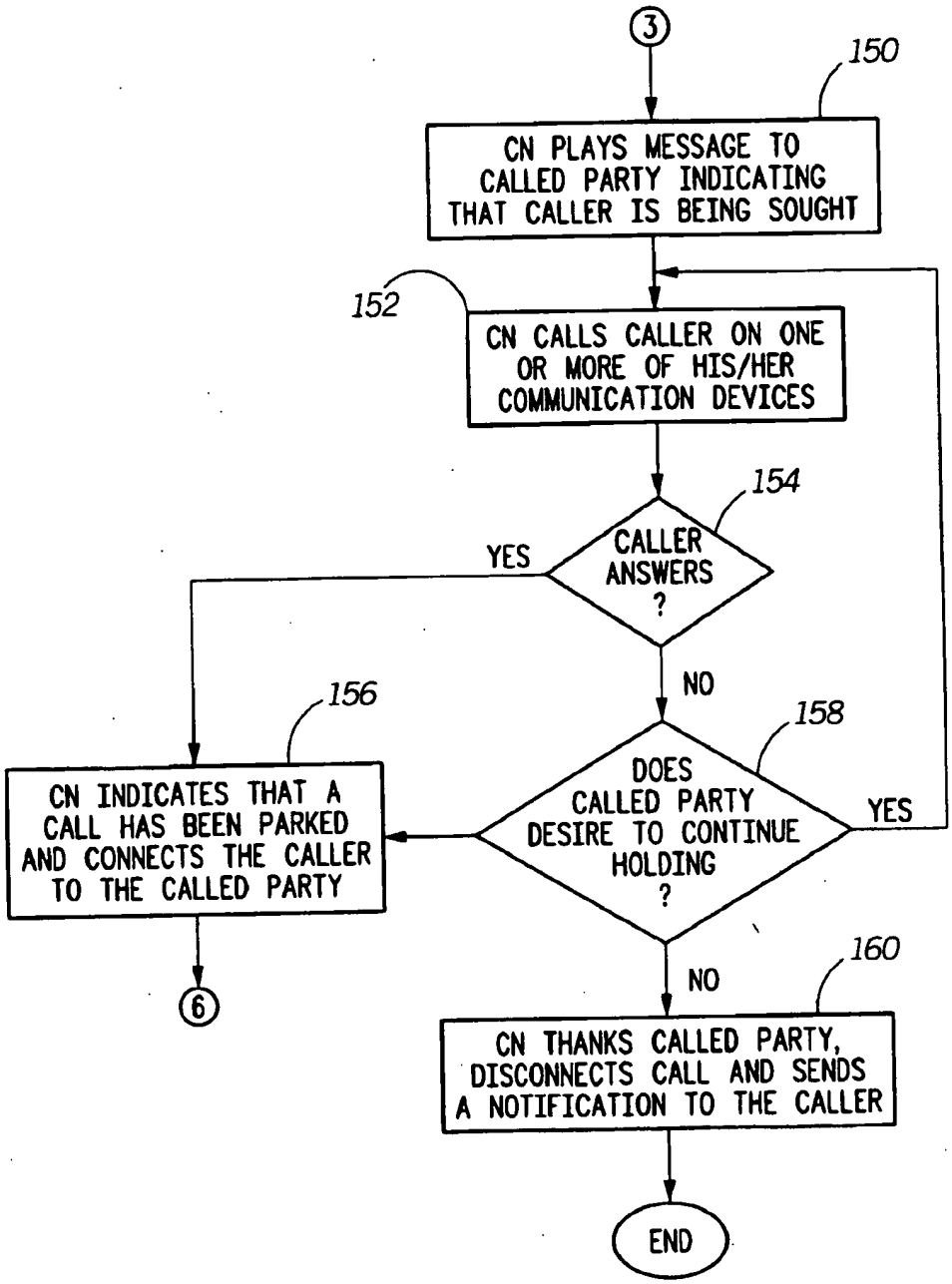
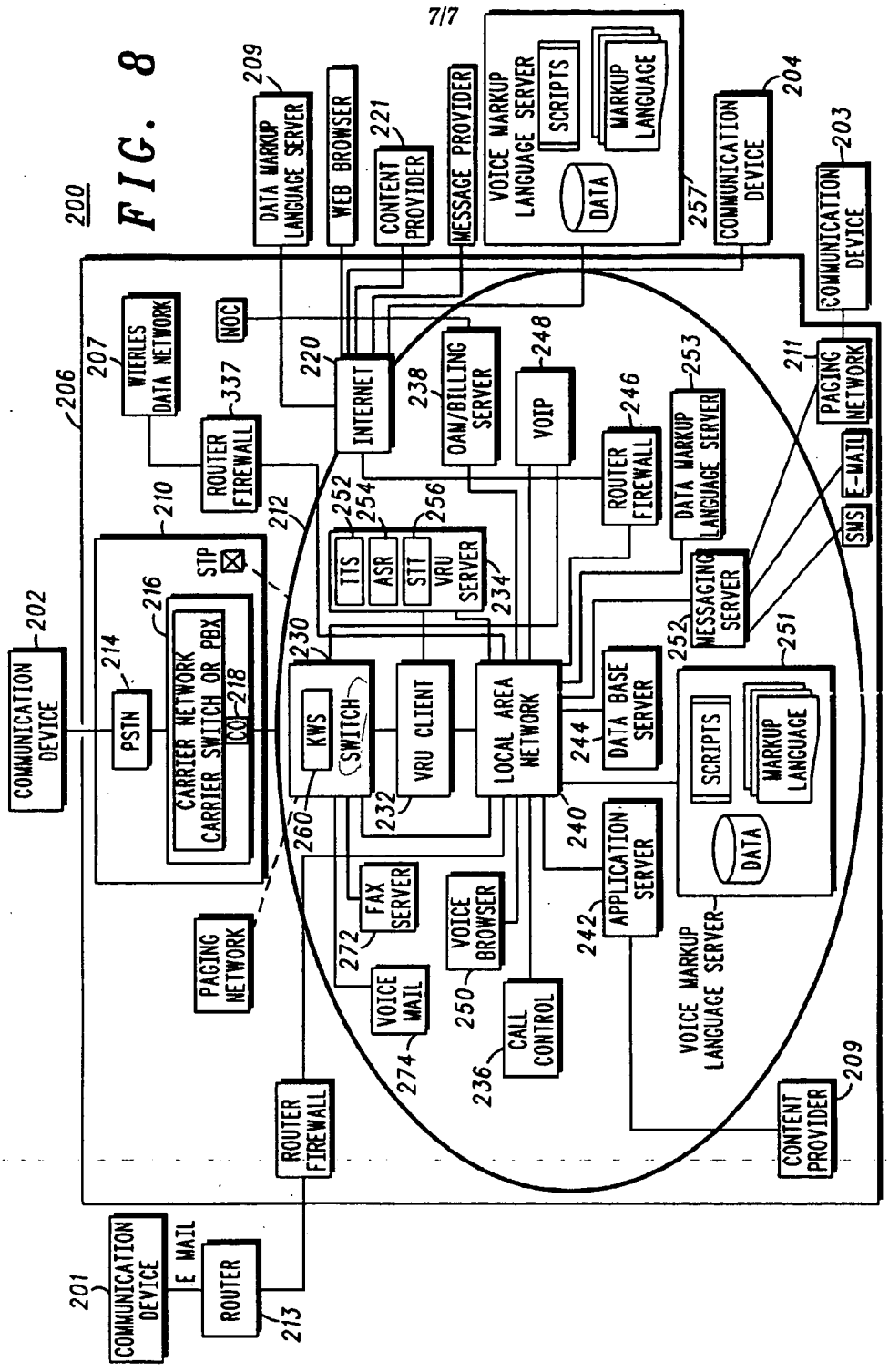

3
150
CN PLAYS MESSAGE TO CALLED PARTY INDICATING THAT CALLER IS BEING SOUGHT
152
CN CALLS CALLER ON ONE OR MORE OF HIS/HER COMMUNICATION DEVICES
154
CALLER ANSWERS ?
YES
NO
156
CN INDICATES THAT A CALL HAS BEEN PARKED AND CONNECTS THE CALLER TO THE CALLED PARTY
158
DOES CALLED PARTY DESIRE TO CONTINUE HOLDING ?
YES
NO
160
CN THANKS CALLED PARTY, DISCONNECTS CALL AND SENDS A NOTIFICATION TO THE CALLER
6
END

FIG. 7

7/7

FIG. 8


200
201
COMMUNICATION DEVICE
E MAIL
ROUTER
213
ROUTER FIREWALL
206
202
COMMUNICATION DEVICE
214
PSTN
216
CARRIER NETWORK CARRIER SWITCH OR PBX
CO 218
210
STP
212
PAGING NETWORK
207
WIERLES DATA NETWORK
337
ROUTER FIREWALL
NOC
220
INTERNET
209
DATA MARKUP LANGUAGE SERVER
WEB BROWSER
221
CONTENT PROVIDER
MESSAGE PROVIDER
VOICE MARKUP LANGUAGE SERVER
SCRIPTS
MARKUP LANGUAGE
DATA
257
COMMUNICATION DEVICE
204
COMMUNICATION DEVICE
203
238
OAM/BILLING SERVER
248
VOIP
246
ROUTER FIREWALL
253
DATA MARKUP LANGUAGE SERVER
211
PAGING NETWORK
E-MAIL
SMS
252
254
256
TTS
ASR
STT
VRU SERVER
234
230
KWS
SWITCH
VRU CLIENT
232
LOCAL AREA NETWORK
MESSAGING SERVER
252
251
DATA BASE SERVER
244
SCRIPTS
MARKUP LANGUAGE
DATA
240
APPLICATION SERVER
242
VOICE MARKUP LANGUAGE SERVER
260
272
FAX SERVER
VOICE BROWSER
250
VOICE MAIL
274
CALL CONTROL
236
CONTENT PROVIDER
209

CALL TRANSFER SYSTEM AND METHOD

FIELD OF THE INVENTION

[0001] The present invention relates generally to communication systems, and more particularly, to call transfer systems and methods.

BACKGROUND OF THE INVENTION

[0002] Typically, Private Branch Exchanges (PBX) and some Public Switched Telephone Networks (PSTN) allow telephone calls to be "parked" and then transferred to another telephone within the same network. These networks typically reside in office environments, in which a number of telephones, each one usually having a designated line or extension, are linked together by a single, common telephone number. When a party or user desires to transfer the call from one telephone to another telephone, the party usually "parks" the call and then transfers it to the other telephone within the same network. The party may transfer the call by directing the network to transfer the call to another extension by using a preset keypad sequence on the telephone unit. The party can then resume the phone call after picking up the other telephone and allowing the call to transfer to the telephone.

[0003] However, this process may not be available to transfer calls across different telecommunication networks (i.e., from a PBX network to a cellular or Internet network.) For instance, a user may not be able to transfer a call from an office telephone (usually within a PBX) to another telephone outside of the office telephone's network, such as a cellular telephone within a cellular network. Accordingly, it would be desirable to allow a party who is engaged in a telephone call with another party to transfer the call to another communication device in a different network without reinitiating the call to the other party.

BRIEF DESCRIPTION OF THE DRAWINGS

[0004] **FIG. 1** is a block diagram of an embodiment of a communication system in accordance with the present invention;

[0005] **FIG. 2** is a more detailed block diagram of one embodiment of the communication system of **FIG. 1**;

[0006] **FIG. 3** is a flowchart that illustrates one embodiment of a call transfer routine in accordance with the present invention;

[0007] **FIG. 4** is a flowchart that illustrates a subroutine of the call transfer routine of **FIG. 3**;

[0008] **FIG. 5** is a flowchart that illustrates another subroutine of the call transfer routine of **FIG. 3**;

[0009] **FIG. 6** is a flowchart that illustrates another subroutine of the call transfer routine of **FIG. 3**;

[0010] **FIG. 7** is a flowchart that illustrates another subroutine of the call transfer routine of **FIG. 3**; and

[0011] **FIG. 8** is an exemplary block diagram of another embodiment of a communication system in accordance with the present invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

[0012] **FIG. 1** is a block diagram that illustrates an embodiment of a communication system **10**. The communication system **10** generally includes one or more network access devices or communication devices **12, 14** (two being shown) and an electronic network **16**. The communication system **10** can provide various services and capabilities to cellular subscribers, wire-line telephone subscribers, paging subscribers, satellite subscribers, mobile or portable telephone subscribers, trunked subscribers, computer network subscribers (e.g., Internet or Intranet subscribers), wireless data subscribers, branch office users and the like. For example, the communication system **10** can provide speech and/or touch-tone recognition, incoming call authorization, call routing, text-to-speech (TTS) and/or speech-to-text (STT) capabilities, call screening, interactive voice applications, etc. As further described below, the communication system **10** can also provide a party with various call transfer capabilities. For example, the communication system **10** allows a party to transfer a call to a communication device associated with another network. The communication system **10** further allows a party to place a call on hold and then be reconnected to the call by dialing into the system from another communication device.

[0013] The communication devices **12, 14** can be utilized by parties or subscribers to access and/or connect with the electronic network **16**. The communication devices **12, 14** can include a variety of forms, including, for example, conventional telephones, mobile telephones, paging units, radio units, wireless data devices, web telephones, portable or wireless telephones, personal information managers (PIMs), personal digital assistants (PDAs), personal computers (PCs), network televisions (TVs), Internet TVs, Internet telephones, portable wireless devices, workstations or any other suitable communication devices. It is contemplated that the communication devices **12, 14** can be integrated with the electronic network **16**.

[0014] The electronic network **16** is coupled to the communication device **12** via line **18**, and to the communication device **14** via line **20**. The lines **18, 20** may preferably include, for example, telephone lines, Integrated Services Digital Network (ISDN) lines, coaxial lines, cable television lines, fiber optic lines, computer network lines, digital subscriber lines, dedicated lines, pay or lease lines, virtual private network lines or the like. Alternatively, the communication devices **12, 14** can wirelessly communicate with the electronic network **16**. For example, the electronic network **16** can communicate with the communication devices **12, 14** by either satellite or wireless communication systems, such as, for example, wireless local loop systems, including Local Multi-point Distribution Systems (LMDS) and Multi-channel Multi-point Distribution Systems (MMDS).

[0015] The electronic network **16** may include, for example, an Intranet, an Extranet, a Local Area Network (LAN), a telephone network, (e.g., a Public Switched Telephone Network (PSTN)), a cellular network, a personal communication system, a TV network (e.g., a cable TV system), a local, regional, national or global paging network, an e-mail system, a wireless data network (e.g., satellite data or local wireless data networks), a wireless LAN, a wireless local loop/distribution system (e.g., LMDS, MMDS or CDMA based system), a Voice Over Internet Protocol (VOIP) network, a communication node, etc. The electronic network **16** can also include a wide area network (WAN), such as, for example, the Internet, the World Wide Web (WWW) or any other similar on-line service.

[0016] Furthermore, the electronic network **16** can provide various calling capabilities to a subscriber. For example, the electronic network **16** can place a call to a particular contact at a selected location or device in response to voice commands or Dual-Tone Multiple-Frequency (DTMF) signals from the caller or subscriber (e.g., "Call Bob at home", "Call Ann at work", or "Dial Bill on mobile phone"). Alternatively, the caller or subscriber can specify a number to be dialed or called, such as, "Call 630-555-1212."

[0017] Furthermore, a caller or subscriber can read or modify a personal file or address book stored in the electronic network **16** through the communication devices **12**, **14**. The address book preferably stores names of parties along with their addresses and telephone numbers. Once the subscriber accesses his or her personal address book, the electronic network **16** can read information about one or more of the parties stored in the address book and can provide various details to the subscriber (e.g., addresses, etc.). The subscriber can then call the party by using voice commands (e.g., "Call Bob"). The subscriber can also enter frequently dialed telephone numbers for voice activated dialing using voice commands. Additionally, the electronic network **16** will allow a subscriber to add a called number to the address book from a listing of previously called numbers made available from the billing records.

[0018] **FIG. 2** illustrates a more detailed block diagram of one embodiment of the communication system **10** of **FIG. 1**. It will be recognized that the communication system can be implemented in various configurations. The communication node can include an electronic assistant to provide various instructions to the subscriber or caller and to respond to voice commands or DTMF tone from the caller as further described below. The communication system **10** can allow a call connected over a first network with a party's first communication device to be transferred or connected to the party's second communication device associated with a second network without the need for a party to reinitiate contact with the other party. For example, a party communicating over a land line telephone associated with a PSTN can instruct the communication node to transfer the call to his/her cellular telephone associated with a cellular network.

[0019] As shown in **FIG. 2**, the electronic network **16** includes a transport system **54** and a communication node **56**. The transport system is preferably connected to the communication node via a high speed data link, such as a T1 telephone line, a local area network (LAN), or a wide area network (WAN). It is contemplated that the communication node **56** may be integrated within or may be remote from the transport system **54**. An example of a communication node **56** is the MIX™ platform and the Myosphere™ Service provided by Motorola, Inc. of Schaumburg, Ill., as further described with reference to **FIG. 8**.

[0020] The transport system **54** routes incoming calls from the communication device **12** to the communication node **56** and routes outgoing calls from the communication node to the communication device **14**. As illustrated in **FIG. 2**, the transport system **54** can include one or more networks, such as, a PSTN **62**, an Internet network **64**, a satellite network **66**, a cellular network **68** and/or any other suitable network. As shown in **FIG. 2**, the first communication device **12** can be operatively connected to the PSTN **62** through a conventional Private Branch Exchange (PBX) **53** and a Central Office (CO) **55** of a carrier. Similarly, the communication device **14** can be operatively connected to the PSTN of the transport system **54** through the CO **57** of a carrier. An Internet Service Provider (ISP) **70** can also operatively connect the communication device **12** to the Internet network **64**. Similarly, the ISP **72** operatively can connect the Internet network **64** to the communication device **14**. Likewise, cellular or mobile phones can be connected to the cellular network by cellular base stations, and satellite phones can be connected to the satellite network via a suitable satellite system (not shown).

[0021] FIGS. **3-7** show block diagrams of a call transfer routine carried out by the communication system **10** to allow a party or subscriber to transfer a call across communication networks. At block **100**, a caller or subscriber places an incoming call to the communication node from a communication device. The incoming call is routed through a first network of the transport system **54** to the communication node **56**. After the communication node or an electronic assistant answers the incoming call, the caller can place an outgoing call to another party (i.e., a called party) based upon commands from the caller at block **102**. The communication node can then connect or link the incoming call to the outgoing call to allow the caller to communicate with the called party at block **104**. Alternatively, the caller can directly dial the phone number of the called party and the communication node or transport system can automatically route the call to the called party.

[0022] At block **106**, the caller or called party decides to transfer the call to another communication device associated with another network of the transport system. The communication node can allow a caller or called party to transfer a call in various ways. If the party wishes to transfer the call while remaining in communication with the other party, the call transfer routine proceeds to subroutine **108**, as further shown in **FIG. 4**. It will be recognized that both the caller and called party may transfer the call to another communication device. Therefore, for convenience, only the situation where the caller transfers a call will be described below.

[0023] As shown in **FIG. 4**, at block **110**, the caller initially instructs the communication node **56** or the electronic assistant to place a call to another of his/her communication devices (i.e., a third communication device) associated with a second network of the transport systems **54**. For example, the caller can instruct the communication node to transfer the call through voice commands (i.e., "transfer the call to my mobile phone"), DTMF tones, or another similar predetermined commands. Alternatively, the call may be transferred using out-of-band signaling. For example, the user may instruct the communication node **56** to transfer the call through commands sent over another network (i.e., the internet or other suitable network) by another communication device (i.e., a computer). For instance, the caller may be communicating with the called party via a telephone call and out-of-band send commands or signals to the communication node over the internet through his/her computer to transfer the call.

[0024] At block **112**, the communication node **56** places a call to the third communication device via the second network of the transport system **68** while the caller and the called party remain in communication with each other. Once the caller answers the call placed to the third communication

device at block **114**, the communication node **56** connects the caller via the third communication device to the called party at block **116**. The communication node then disconnects the original connection established between the caller and the communication node at block **118**. At block **120**, the caller and the called party can communicate with each other. This process can also be utilized to additional parties to the call. For example, the caller may instruct the communication node to call another party on the same or another network (i.e., call Susan on Mobile phone or dial 888-123-4567) to establish a three-way conference call between the caller, the called party, and the new party. The communication node can access the address book of the caller to determine the party's number (i.e., Susan) and then call the party.

[0025] Referring again to **FIG. 3**, if the caller desires place the call on hold and then transfer the call to another or third communication device associated with a second network at block **106**, the caller can instruct the communication node to park the call and to transfer the call to the third communication device at block **122** (i.e., "please transfer the call to my cell phone"). The call transfer routine then proceeds to subroutine **124**, as shown in reference to **FIG. 5**.

[0026] As shown in **FIG. 5**, when the caller parks the call at block **127**, the communication node disconnects the connection between the caller's communication device and the communication node, while maintaining the connection between the communication node **56** and the called party. At block **128**, the communication node places a call through a second network of the transfer system to the third communication device. Once the caller answers the third communication device, the communication node connects the caller via the third communication device to the called party at block **130**. At block **132**, the caller is again in communication with the called party. If the caller does not answer the call within a certain time period, the call transfer routine then proceeds to block **126** as further described below.

[0027] Referring again to **FIG. 3**, if the caller desires place the call on hold and call back into the communication node with another or third communication device associated with another network at block **106**, the call transfer routine proceeds to subroutine **130**, as further described below in reference to **FIG. 6**.

[0028] As shown in **FIG. 6**, the caller instructs the communication node to park the call or place the call on hold at block **132** (i.e., "please put the call on hold"). It should be noted the caller may notify the communication node or the electronic assistant about transferring the call (i.e., "I will be calling back on another phone"). At block **134**, the communication node disconnects the connection between the caller and the communication device while maintaining the connection between the communication node and the called party. The communication node then waits for a call from the caller at block **136**.

[0029] Once the caller calls into the communication node on the third communication device, the node answers the call and the caller can instruct the communication node to connect him/her to the called party at block **138** (i.e., "connect me to my previous call" or "connect me with Bob" (the called party)). After the node connects the caller to the called party at block **140**, the caller can communicate with the called party at block **142**. This feature may be useful in situations in which the caller does not know to which device the communication node should direct the call. If the caller does not call into the node within a certain time period, the call transfer routine proceeds to block **126** of **FIG. 3**.

[0030] As shown in **FIG. 3**, the communication node determines whether a connection has been re-established between the caller and the called party at block **126**. If the caller has been reconnected to the call, the call transfer routine proceeds to block **144**. If, after a specified amount of time, the caller has not been re-connected to the call, the communication node **56** will attempt to locate the subscriber and proceed to subroutine **148**, as further described below in reference to **FIG. 7**.

[0031] As shown in **FIG. 7**, the communication node **56** notifies the called party of the status of the communication node **56** (i.e., "attempting to contact the caller") at block **150**. At block **152**, the communication node **56** attempts to call the caller on one of his/her communication devices. If the caller answers the call at block **154**, the communication node indicates that he/she has a parked call or a call on hold and connects the caller to the called party, thus re-establishing the communication between the called party and the caller at block **156**. If the subscriber does not answer the call from the communication node, the communication node then asks the called party if he/she would like to continue holding at block **158**. If the called party does not desire to continue holding, the communication node disconnects the called party from the communication node and sends a notification about the abandon call to the caller to one of the caller's communication devices (i.e., computer, email system, paging unit, phone, etc.) at block **160**; otherwise, the communication node **56** will and again attempt to locate the subscriber at block **152**. Although the situation where the caller transfers the call to the another communication device has been described above, it will be recognized that the called party can also transfer a call in the same or similar manner.

[0032] Referring now to **FIG. 8**, an exemplary block diagram of another embodiment of a communication system **200** having the capability to transfer calls across various networks is illustrated. The communication system **200** of **FIG. 8** can carry out the call transfer routine shown in FIGS. **3-7** to allow a party to transfer a call. For example, the communication node can transfer a call from a communication device connected through the PSTN of the telecommunication network to a communication device associated with a wireless data network.

[0033] The communication system **200** generally includes one or more communication devices or network access devices **201**, **202**, **203**, **204**, **205** (five being shown), an electronic network **206**, and one or more information sources (e.g., content providers **208**, **221** (two being shown) and data and voice markup language servers **209**, **251**, **253**, **257**). The communication devices can be the same or similar to the communication devices described in reference to **FIGS. 1 and 2**. Accordingly, further description of the communication devices is unnecessary for a complete understanding of the present embodiment. The user or subscriber can access the electronic network **206** by dialing a single direct access telephone number (e.g., a foreign exchange telephone number, a local telephone number, or a toll-free telephone number or PBX) from the communication device **202**. The subscriber can also access the elec-

tronic network **206** from the communication device **204** via the Internet or WWW, from the communication device **203** via a paging network **211**, or from the communication device **201** via a local area network (LAN), wireless data network, a wide area network (WAN), or an e-mail connection. It will be recognized that the system can be accessed in various ways depending on the configuration of the system.

[0034] As shown in **FIG. 8**, the electronic network **206** of the system **200** includes a telecommunication network **210** and a communication node **212**. The telecommunication network **210** is preferably connected to the communication node **212** via a high-speed data link, such as, a T1 telephone line, a local area network (LAN), a wide area network (WAN) or a VOIP network. The telecommunication network **210** preferably includes a public switched network (PSTN) **214** and a carrier network **216**. The telecommunication network **210** can also include international or local exchange networks, a cable television network, interexchange carrier networks (IXC) or long distance carrier networks, cellular networks (i.e., mobile switching centers (MSC)), PBXs, satellite systems, wireless data networks, and other switching centers such as conventional or trunked radio systems (not shown), etc. The electronic network can also include additional telecommunication networks, such as a wireless data network **207** or any of the networks or systems described above.

[0035] The PSTN **214** of the telecommunication network **210** can include various types of communication equipment or apparatus, such as ATM networks, Fiber Distributed data networks (FDDI), T1 lines, cable television networks, VOIP networks and the like. The carrier network **216** of the telecommunication network **210** generally includes a telephone switching system or central office **218**. It will be recognized that the carrier network **216** can be any suitable system that can route calls to the communication node **212**, and the telephone switching system **218** can be any suitable wireline or wireless switching system.

[0036] The communication node **212** the system **200** is preferably configured to receive and process incoming calls from the carrier network **216** and the Internet **220**, such as the WWW. The communication node can receive and process pages from the paging network **211** and can also receive and process messages (i.e., e-mails) from the LAN, WAN, wireless data network or e-mail connection **213**.

[0037] When a user dials into the electronic network **206** from the communication device **202**, the carrier network **216** routes the incoming call from the PSTN **214** to the communication node **212** over one or more telephone lines or trunks. The incoming calls preferably enters the carrier network **216** through one or more "888" or "800" INWATS trunk lines, local exchange trunk lines, or long distance trunk lines. It is also contemplated that the incoming calls can be received from a cable network, a cellular system, VOIP network or any other suitable system.

[0038] The communication node **212** answers the incoming call from the carrier network **216** and retrieves an appropriate announcement (i.e., a welcome greeting) from a database, server, or browser. The node **212** then plays the announcement to the caller. In response to audio inputs from the user, the communication node **212** retrieves information from a destination or database of one or more of the information sources, such as the content providers **208** and **221** or the voice or data markup language servers **209**, **251**, **253** and **257**. After the communication node **212** receives the information, the communication node provides a response to the user based upon the retrieved information.

[0039] The node **212** can provide various dialog voice personalities (i.e., a female voice, a male voice, etc.) and can implement various grammars (i.e., vocabulary) to detect and respond to the audio inputs from the user. In addition, the communication node can automatically select various speech recognition models (i.e., an English model, a Spanish model, an English accent model, etc.) based upon a user profile, the user's communication device, and/or the user's speech patterns. The communication node **212** can also allow the user to select a particular speech recognition model.

[0040] When a user accesses the electronic network **206** from a communication device registered with the system (i.e., a user's home phone, work phone, cellular phone, etc.), the communication node **212** can by-pass a user screening option and automatically identify the user (or the type of the user's communication device) through the use of automatic number identification (ANI) or caller line identification (CLI). After the communication node verifies the call, the node provides a greeting to the user (i.e., "Hi, this is your personal agent, Maya. Welcome Bob. How may I help you?"). The communication node then enters into a dialogue with the user, and the user can select a variety of information offered by the communication node.

[0041] When the user accesses the electronic network **206** from a communication device not registered with the system (i.e., a payphone, a phone of a non-subscriber, etc.), the node answers the call and prompts the user to enter his or her name and/or a personal identification number (PIN) using speech commands or DTMF tones. The node can also utilize speaker verification to identify a particular speech pattern of the user. If the node authorizes the user to access the system, the node provides a personal greeting to the user (i.e., "Hi, this is your personal agent, Maya. Welcome Ann. How may I help you?"). The node then enters into a dialogue with the user, and the user can select various information offered by the node. If the name and/or PIN Number of the user cannot be recognized or verified by the node, the user will be routed to a customer service representative.

[0042] Once the user has accessed the system, the user may implement a wide variety of services and features by using voice commands, such as, for example, voice dialing, voice paging, facsimiles, caller announcements, voice mails, reminders, call forwarding, call recording, content information (i.e. newspapers, etc.), read e-mail, read calendars, read "to-do" lists, banking, v-commerce, e-commerce, etc. The system can place outbound calls and pages to business and personal parties or contacts (i.e., friends, clients, business associates, family members, etc.) in response to DTMF tones or speech commands. The calls can be routed through a telephone or electronic network to the selected party and the pagers can be sent to a selected party via a paging system. The system can also receive calls routed through a telephone or electronic network.

[0043] As shown in **FIG. 8**, the communication node **212** preferably includes a telephone switch **230**, a voice or audio recognition (VRU) client **232**, a voice recognition (VRU) server **234**, a controller or call control unit **236**, an Operation

and Maintenance Office (OAM) or a billing server unit **238**, a local area network (LAN) **240**, an application server unit **242**, a database server unit **244**, a gateway server or router firewall server **246**, a voice over internet protocol (VOIP) unit **248**, a voice browser **250**, a voice markup language server **251**, a messaging server **255**, and a data markup language server **253**. Although the communication node **212** is shown as being constructed with various types of independent and separate units or devices, the communication node **212** can be implemented by one or more integrated circuits, microprocessors, microcontrollers, or computers which may be programmed to execute the operations or functions equivalent to those performed by the device or units shown. It will also be recognized that the communication node **212** can be carried out in the form of hardware components and circuit designs, software or computer programming, or a combination thereof.

[0044] The communication node **212** can be located in various geographic locations throughout the world or the United States (i.e., Chicago, Ill.). The communication node **212** can be operated by one or more carriers (i.e., Sprint PCS, Qwest Communications, MCI, etc.) or independent service providers, such as, for example, Motorola, Inc.

[0045] The communication node **212** can be co-located or integrated with the carrier network **216** (i.e., an integral part of the network) or can be located at a remote site from the carrier network **216**. It is also contemplated that the communication node **212** may be integrated into a communication device, such as, a wireline or wireless phone, a radio device, a personal computer, a PDA, a PIM, etc. In this arrangement, the communication device can be programmed to connect or link directly into an information source.

[0046] The communication node **212** can also be configured as a standalone system to allow users to dial directly into the communication node via a toll free number or a direct access number. In addition, the communication node **212** may comprise a telephony switch (i.e., a PBX or Centrix unit), an enterprise network, or a local area network. In this configuration, the system **200** can be implemented to automatically connect a user to the communication node **212** when the user picks a communication device, such as, the phone.

[0047] When the telephone switch **230** of the communication node **212** receives an incoming call from the carrier network **216**, the call control unit **236** sets up a connection in the switch **230** to the VRU client **232**. The communication node **212** then enters into a dialog with the user regarding various services and functions. The VRU client **232** preferably generates pre-recorded voice announcements and/or messages to prompt the user to provide inputs to the communication node using speech commands or DTMF tones. In response to the inputs from the user, the node **212** retrieves information from a destination of one of the information sources and provides outputs to the user based upon the information.

[0048] The telephone switch **230** of the telecommunication node **212** is preferably connected to the VRU client **232**, the VOIP unit **248**, and the LAN **240**. The telephone switch **230** receives incoming calls from the carrier switch **216**. The telephone switch **230** also receives incoming calls from the communication device **204** routed over the Internet **220** via the VOIP unit **248**. The switch **230** also receives messages and pages from the communication devices **201** and **203**, respectively. The telephone switch **230** is preferably a digital cross-connect switch, Model No. LNX, available from Excel Switching Corporation, 255 Independence Drive, Hyannis, Mass. 02601. It will be recognized that the telephone switch **230** can be any suitable telephone switch.

[0049] The VRU client **232** of the communication node **212** is preferably connected to the VRU server **234** and the LAN **240**. The VRU client **232** processes speech communications, DTMF tones, pages, and messages (i.e., emails) from the user. Upon receiving speech communications from the user, the VRU client **232** routes the speech communications to the VRU server **234**. When the VRU client **232** detects DTMF tones, the VRU client **232** sends a command to the call control unit **236**. It will be recognized that the VRU client **232** can be integrated with the VRU server.

[0050] The VRU client **232** preferably comprises a computer, such as, a Windows NT compatible computer with hardware capable of connecting individual telephone lines directly to the switch **230** or carrier network **216**. The VRU client preferably includes a microprocessor, random access memory, read-only memory, a T1 or ISDN interface board, and one or more voice communication processing board (not shown). The voice communication processing boards of the VRU client **232** are preferably Dialogic boards, Model No. Antares, available from Dialogic Corporation, 1515 Route 10, Parsippany, N.J. 07054. The voice communication boards may include a voice recognition engine having a vocabulary for detecting a speech pattern (i.e., a key word or phrase). The voice recognition engine is preferably a RecServer software package, available from Nuance Communications, 1380 Willow Road, Menlo Park, Calif. 94025.

[0051] The VRU client **232** can also include an echo canceler (not shown) to reduce or cancel text-to-speech or playback echoes transmitted from the PSTN **214** due to hybrid impedance mismatches. The echo canceler is preferably included in an Antares Board Support Package, available from Dialogic.

[0052] The call control unit **236** of the communication node **212** is preferably connected to the LAN **240**. The call control unit **236** sets up the telephone switch **230** to connect incoming calls to the VRU client **232**. The call control unit also sets up incoming calls or pages into the node **212** over the internet **220** and pages and messages sent from the communication devices **201** and **203** via the paging network **203** and e-mail system **213**. The control call unit **236** preferably comprises a computer, such as, a Window NT compatible computer.

[0053] The LAN **240** of the communication node **212** allows the various components and devices of the node **212** to communicate with each other via a twisted pair, a fiber optic cable, a coaxial cable, or the like. The LAN **240** may use Ethernet, Token Ring, or other suitable types of protocols. The LAN **240** is preferably a 100 Megabit per second Ethernet switch, available from Cisco Systems, San Jose, Calif. It will be recognized that the LAN **240** can comprise any suitable network system, and the communication node **212** may include a plurality of LANs.

[0054] The VRU server **234** of the communication node **212** is connected to the VRU client **232** and the LAN **240**. The VRU server **234** receives speech communications from

the user via the VRU client **232**. The VRU server **234** processes the speech communications and compares the speech communications against a vocabulary or grammar stored in the database server unit **244** or a memory device. The VRU server **234** provides output signals, representing the result of the speech processing, to the LAN **240**. The LAN **240** routes the output signal to the call control unit **236**, the application server **242**, and/or the voice browser **250**. The communication node **212** then performs a specific function associated with the output signals.

[0055] The VRU server **234** preferably includes a text-to-speech (TTS) unit **252**, an automatic speech recognition (ASR) unit **254**, and a speech-to-text (STT) unit **256**. The TTS unit **252** of the VRU server **234** receives textual data or information (i.e., e-mail, web pages, documents, files, etc.) from the application server unit **242**, the database server unit **244**, the call control unit **236**, the gateway server **246**, the application server **242**, and the voice browser **250**. The TTS unit **252** processes the textual data and converts the data to voice data or information.

[0056] The TTS unit **252** can provide data to the VRU client **232** which reads or plays the data to the user. For example, when the user requests information (i.e., news updates, stock information, traffic conditions, etc.), the communication node **212** retrieves the desired data (i.e., textual information) from a destination of the one or more of the information sources and converts the data via the TTS unit **252** into a response.

[0057] The response is then sent to the VRU client **232**. The VRU client processes the response and reads an audio message to the user based upon the response. It is contemplated that the VRU server **234** can read the audio message to the user using human recorded speech or synthesized speech. The TTS unit **252** is preferably a TTS 2000 software package, available from Lernout and Hauspie Speech Product NV, 52 Third Avenue, Burlington, Mass. 01803.

[0058] The ASR unit **254** of the VRU server **234** provides speaker dependent or independent automatic speech recognition of speech inputs or communications from the user. It is contemplated that the ASR unit **254** can include speaker dependent speech recognition. The ASR unit **254** processes the speech inputs from the user to determine whether a word or a speech pattern matches any of the grammars or vocabulary stored in the database server unit **244** or downloaded from the voice browser. When the ASR unit **254** identifies a selected speech pattern of the speech inputs, the ASR unit **254** sends an output signal to implement the specific function associated with the recognized voice pattern. The ASR unit **254** is preferably a speaker independent speech recognition software package, Model No. RecServer, available from Nuance Communications. It is contemplated that the ASR unit **254** can be any suitable speech recognition unit to detect voice communications from a user.

[0059] The STT unit **256** of the VRU server **234** receives speech inputs or communications from the user and converts the speech inputs to textual information (i.e., a text message). The textual information can be sent or routed to the communication devices **201**, **202**, **203** and **204**, the content providers **208** and **209**, the markup language servers, the voice browser, and the application server **242**. The STT unit **256** is preferably a Naturally Speaking software package, available from Dragon Systems, 320 Nevada Street, Newton, Mass. 02160-9803.

[0060] The VOIP unit **248** of the telecommunication node **212** is preferably connected to the telephone switch **230** and the LAN **240**. The VOIP unit **248** allows a user to access the node **212** via the Internet **220** or VOIP public network using voice commands. The VOIP unit **240** can receive VOIP protocols (i.e., H.323 protocols) transmitted over the Internet **220** or intranet and can convert the VOIP protocols to speech information or data. The speech information can then be read to the user via the VRU client **232**. The VOIP unit **248** can also receive speech inputs or communications from the user and convert the speech inputs to a VOIP protocol that can be transmitted over the Internet **220**. The VOIP unit **248** is preferably a Voice Net software package, available from Dialogic Corporation. It will be recognized that the VOIP device can be incorporated into a communication device.

[0061] The telecommunication node **212** also includes a detection unit **260**. The detection unit **260** is preferably a phrase or key word spotter unit to detect incoming audio inputs or communications or DTMF tones from the user. The detector unit **260** is preferably incorporated into the switch **230**, but can be incorporated into the VRU client **232**, the carrier switch **216**, or the VRU server **256**. The detection unit **260** is preferably included in a RecServer software package, available from Nuance Communications.

[0062] The detection unit **260** records the audio inputs from the user and compares the audio inputs to the vocabulary or grammar stored in the database server unit **244**. The detector unit continuously monitors the user's audio inputs for a key phase or word after the user is connected to the node **212**. When the key phrase or word is detected by the detection unit **260**, the VRU client **232** plays a pre-recorded message to the user. The VRU client **232** then responds to the audio inputs provided by the user.

[0063] The billing server unit **238** of the communication node **212** is preferably connected to the LAN **240**. The billing server unit **238** can record data about the use of the communication node by a user (i.e., length of calls, features accessed by the user, etc.). Upon completion of a call by a user, the call control unit **236** sends data to the billing server unit **238**. The data can be subsequently processed by the billing server unit in order to prepare customer bills as described above. The billing server unit **238** can use the ANI or CLI of the communication device to properly bill the user. The billing server unit **238** preferably comprises a Windows NT compatible computer.

[0064] The gateway server unit **246** of the communication node **212** is preferably connected to the LAN **240** and the Internet **220**. The gateway server unit **246** provides access to the content provider **208** and the markup language server **257** via the Internet **220**. The gateway unit **246** also allows users to access the communication node **212** from the communication device **204** via the Internet **220**. The gateway unit **246** can further function as a firewall to control access to the communication node **212** to authorized users. The gateway unit **246** is preferably a Cisco Router, available from Cisco Systems, San Jose, Calif.

[0065] The database server unit **244** of the communication node **212** is preferably connected to the LAN **240**. The database server unit **244** preferably includes a plurality of storage areas to store data relating to users, speech vocabularies, dialogs, personalities, user entered data, and other

information. Preferably, the database server unit **244** stores a personal file or address book. The personal address book can contain information required for the operation of the system, including user reference numbers, personal access codes, personal account information, contact's addresses, and phone numbers, etc. The database server unit also stores user data, such as the user's home phone number, address, billing information, etc. The database server unit **244** is preferably a computer, such as an NT Window compatible computer.

[0066] The application server **242** of the communication node **212** is preferably connected to the LAN **240** and the content provider **209**. The application server **242** allows the communication node **212** to access information from a destination of the information sources, such as the content providers and markup language servers. For example, the application server can retrieve information (i.e., weather reports, stock information, traffic reports, restaurants, flower shops, banks, calendars, "to-do" lists, e-commerce, etc.) from a destination of the information sources. This application server may include Starfish Software to provide the address book, calendar, and to-do lists and allow the user to organize information. The application server **242** processes the retrieved information and provides the information to the VRU server **234** and the voice browser **250**. The VRU server **234** can provide an audio announcement to the user based upon the information using text-to-speech synthesizing or human recorded voice. The application server **242** can also send tasks or requests (i.e., transactional information) received from the user to the information sources (i.e., a request to place an order for a pizza). The application server **242** can further receive user inputs from the VRU server **234** based upon a speech recognition output. The application server is preferably a computer, such as an NT Windows compatible computer.

[0067] The voice markup language server **251** of the communication node **212** is preferably connected to the LAN **240**. The markup language server **251** can include a database, scripts, and markup language documents or pages. The data markup language server **253** of the communication node **212** is also preferably connected to the LAN **240**. The voice and date markup language servers **251** and **253** are preferably computers, such as an NT Window Compatible Computers. It will also be recognized that the markup language server **251** can be an Internet server (i.e., a Sun Microsystems server).

[0068] The messaging server **255** of the communication node **212** is preferably connected to the LAN **240**, the paging network **211**, an E-Mail system **285**, and a short message system **290**. The messaging server **255** routes pages between the LAN **240** and the paging network. The messaging server **255** is preferably a computer, such as an NT compatible computer. The message server can also provide email storage. It is contemplated that the messaging server **255** can reside externally from the node. The messaging server can further include Exchange Server software from Microsoft Corporation.

[0069] The voice browser **250** of the system **200** is preferably connected to the LAN **240**. The voice browser **250** preferably receives information from the information sources, such as the content provider **209** via the application server **242**, the data and voice markup language servers **251** and **257**, the database **244**, and the content provider **208**, **209**. In response to voice inputs from the user or DTMF tones, the voice browser **250** generates a content request (i.e., an electronic address) to navigate to a destination of one or more of the information sources. The content request can use at least a portion of a URL, an URN, an IP, a page request, or an electronic e-mail.

[0070] After the voice browser is connected to an information source, the voice browser preferably uses a TCP/IP connection to pass requests to the information source. The information source responds to the requests, sending at least a portion of the requested information, represented in electronic form, to the voice browser. The information can be stored in a database of the information source and can include text content, markup language document or pages, non-text content, dialogs, audio sample data, recognition grammars, etc. The voice browser then parses and interprets the information as further described below. It will be recognized that the voice browser can be integrated into the communication devices **201**, **202**, **203**, and **204**.

[0071] As shown in **FIG. 8**, the content provider **208** is connected to the application server **244** of the communication node **212**, and the content provider **209** is connected to the gateway server **246** of the communication node **212** via the Internet **220**. The content providers can store various content information, such as news, banking, v-commerce, e-commerce, weather, traffic conditions, etc. The content providers **208** and **209** can include a server to operate web pages or documents in the form of a markup language. The content providers **208** and **209** can also include a database, scripts, and/or markup language documents or pages. The scripts can include images, audio, grammars, computer programs, etc. The content providers execute suitable server software to send requested information to the voice browser.

[0072] The voice mail unit **274** of the telecommunication node **206** is preferably connected to the telephone switch **203** and the LAN **240**. The voice mail unit **274** can store voice mail messages from users or other parties trying to send messages to users of the node. When a user accesses the telecommunication node **206**, the voice mail unit **274** can notify the user of new and stored messages. The user can access the messages to play, delete, store and forward the messaged. When the user accesses a message, the message can be read to the user or can be displayed as textual information on a communication device (i.e., a pager, a SMS, or a PDA, etc.). The user can also access and operate external messages or mail systems remote from the telecommunication node **206**.

[0073] The fax server unit **272** of the telecommunication node **206** is preferably connected to the telephone switch **230** and the LAN **240**. The fax server unit **272** receivers and stores facsimile information sent via the electronic network **220** or the carrier switch **216**. The users can access the facsimile information to play, store, delete, and forward the information. The facsimile information can be read to the user via the TTS unit **252** or can be displayed as textual information on a suitable communication device. The fax server unit **272** preferably comprises a computer such as, an NT compatible computer or a Dialogue Fax Server.

[0074] Further information regarding the communication system **200** is disclosed in U.S. patent application Ser. No.

09/141,485 entitled Telecommunication System and Methods therefor, filed Aug. 27, 1998, the entire disclosure of which is incorporated herein.

[0075] It should be appreciated that the embodiments described above are to be considered in all respects only illustrative and not restrictive. The scope of the invention is indicated by the following claims rather than by the foregoing description. All changes that come within the meaning and range of equivalents are to be embraced within their scope.

We claim:

1. A method of transferring a call across networks of a transport system, the transport system capable of providing a connection between a communication node and first, second and third communication devices, the method comprising the steps of:

connecting the first communication device to the communication node over a first network of the transport system;

connecting the second communication device with the first communication device;

in response to a command received over the first network, establishing a connection between the third communication device and the communication node over a second network of the transport system, the second network being different than the first network; and

connecting the second communication device to the third communication device.

2. The method of claim 1, wherein the establishing step includes:

placing the call from the communication node to the third communication device over the second network.

3. The method of claim 1, wherein the establishing step includes:

receiving a call from a third communication device via the second network.

4. The method of claim 1, further comprising the step of disconnecting the first communication device from the communication node.

5. The method of claim 2, further comprising the step of disconnecting the first communication device from the communication node after placing the call to the third communication device.

6. The method of claim 2, further comprising the step of disconnecting the first communication device from the communication node prior to placing the call to the third communication device.

7. The method of claim 2, further comprising the step of receiving a signal from the third communication device to connect the communication node to the third communication device via the second network.

8. The method of claim 2, further comprising the step of receiving a signal from the fourth communication device to connect the communication node to the third communication device via the second network.

9. The method of claim 1, further comprising the step of receiving a signal from a fourth communication device to connect the communication node to the fourth communication device via the second transport system prior to connecting the second communication device to the third communication device.

10. The method of claim 2, further comprising the step of comparing a signal with an instruction set associated with the communication node, wherein the signal comprises a set of inband and out of band signals.

11. The method of claim 1, wherein the first and second networks include one of a Public Switched Telephone Network, a cellular network, a satellite system, a wireless local loop network, a paging network, an Internet, and a Voice Over Internet Protocol network.

12. The method of claim 1, wherein the first, second and third communication devices include one of a telephone, a satellite telephone, a paging unit, a computer, a personal digital assistant, and a cellular telephone.

13. A system for transferring a call across networks of a transport system, the transport system capable of providing a connection between a communication node and first, second and third communication devices, the method, comprising:

computer readable program code to establish a connection over a first network of the transport system between the first communication device and the communication node;

computer readable program code to connect the first communication device to the second communication device;

computer readable program code to establish a connection over a second network between the third communication device and the communication node, the second network being different than the first network; and

computer readable program code to connect the third communication device to the second communication device.

14. The system of claim 13 further comprising computer readable program code to place a call to the third communication device.

15. The system of claim 13 further comprising computer readable program code to receive a call from a third communication device.

16. The system of claim 13, further comprising:

computer readable program code to disconnect the first communication device from the communication node.

17. The system of claim 13, further comprising:

computer readable program code to receive a signal from the third communication device to connect the communication node to the third communication device via the second network.

18. The system of claim 13, further comprising:

computer readable program code to receive a signal from a fourth communication device to connect the communication node to the fourth communication device via the second network prior to connecting the second communication device to the third communication device.

19. The system of claim 13 comprising:

computer readable code to receive a signal from the fourth communication device to connect the communication node to the third communication device via the second network.

20. The system of claim 13, further comprising:

computer readable program code to establish a connection between the third communication device and the first and second communication devices.

21. The system of claim 13, further comprising:

computer readable program code to compare the signal, which comprises a set of inband and out of band signals, with an instruction set associated with the communication node.

22. A program for transferring a call across networks of a transport system, the transport system capable of providing a connection between a communication node and first, second and third communication devices, the method, comprising:

computer readable program code to establish a connection over a first network of the transport system between the first communication device and the communication node;

computer readable program code to connect the first communication device to the second communication device;

computer readable program code to establish a connection over a second network between the third communication device and the communication node; and

computer readable program code to connect the third communication device to the second communication device.

23. The program of claim 22 further comprising: computer readable program code to place the call from the communication node to the third communication device via the second transport system.

24. The program of claim 22 further comprising:

computer readable program code to receive a call from a third communication device via a second transport system to the communication node.

25. A method of transferring a call comprising the steps of:

establishing a first communication channel over a first network with a first party;

establishing a second communication channel with a second party;

linking the first communication channel to the second communication channel so that the first and second party can communicate;

establishing a third communication channel over a second network with the first party without human operator assistance, the second network being different than the first network; and

linking the third communication channel to the to the first communication channel so that the first party can communicate with the second party over the second network.

26. A method of transferring a call comprising the steps of:

establishing a first connection over a first network between an electronic assistant and a first party;

connecting the first party to a second party so that they may communicate with each other over the first connection;

in response to receiving a transfer command, establishing a second connection over a second network between the first party and the electronic assistant, the second network being different than the first network; and

linking the first party to the second party can communicate over the second network.

27. In a cellular network, a method of transferring a call comprising the steps of:

establishing a first connection over a first network between a communication node and a first party;

connecting the first party to a second party so that they may communicate with each other over the first connection;

in response to receiving a command from the first party, establishing a second connection over a second network between the first party and the communication node, the second network being different than the first network; and

linking the first party to the second party so that the first party and second party can communicate over the second network.

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